

Plant Chromatography
Extending the uses of paper chromatography

Grade Level: 8

Time: 1 Days (40 minute session)

Goals & Objectives:

Goals:

- Have student create paper chromatography profile
- Work collaboratively
- Interdisciplinary work
- Have students practice using rulers
- Have students understand how chromatography is used in ecology

Objectives:

Students will be able to:

- Use chromatography to separate pigments in plants
- Measure, using the ruler
- Understand the equation ($R_f = \text{distance from start to center of spot} / \text{distance from start to solvent front}$), as it relates to distance and time
- Explain how math is used to study nature

Materials:

For each group of students

- 7.5 x 7.7cm square of filter paper (cut coffee filter or paper towel)
- 4 different plant samples from SOC trip
- Ruler
- Graduated cylinder
- pencil
- Rubbing alcohol
- Paper clip
- String or twine (20 cm long)
- Tape
- Shallow (8 cm deep) container wide enough to fit filter paper

NJCCS:

4.1.8A2, 4.2.8D1, 5.1.8A1, 5.1.8A2, 5.1.8A3, 5.1.8B1, 5.1.8B3, 5.6.8A4

Procedure:

1. Lead class discussion:

- Ask students to what they know about plants and why do leaves change colors in the fall?

- What might a researcher do to study colors in plants?
2. The students will be creating a paper chromatography profile with four plant samples from the SOC trip. (Teacher: this is a follow-up lesson to the ink chromatography)
 3. Have students draw a line 1.5cm from the bottom edge of the filter paper with a ruler and pencil. It is very important that a pencil is used because ink will separate over the sample.
 4. Allow students to determine the best spacing for 4 evenly spaced dots along the penciled line, and make a small ink mark at the point.
 5. On the white-board, determine a legend for the plants (Oak = A, birch= B, Cabbage = C). Students should label the point (at the top of the filter paper) with pencil.
 6. Place a paperclip halfway onto the top-center of the filter paper, and slide the piece of string through the paperclip. Stretch the string across the diameter of the container and secure the ends with tape. The filter paper should be suspended without touching the bottom of the container.
 7. Have students determine how much solvent is needed to fill the container to 0.5cm using the formula for volume ($L \times W \times H$). Use a graduated cylinder to measure the appropriate volume, and pour it into the container.
 8. Record the time, and allow the solvent to travel up the filter paper.
 9. Remove the filter paper when the solvent has traveled 3-4 cm or as time will allow, and have students mark the solvent front (where the solvent reached)
 10. Asks students to make observations:
 - What did you notice about the plant smear as the solvent moved up?
 - Record the pigment fronts for each plant tested and the solvent front.
 - How does this relate to the crime scene investigation?
 11. Determine the ratio of fronts (a characteristic for any given compound).
 12. As the solvent travels through the test substance some of the test substance will be attracted to the solvent and follow it up the filter paper. Since different molecules will be attracted and move different distances the inks will separate. The results will be bands of different pigments.

Accommodations:

SLD

- Assign groups
- Assign specific tasks (recorder, measurer, marker, explainer, etc.)
- Provide additional activity sheet with empty tables on it.
- Enlarge diagrams on board/overhead (see attachment)

ELL

- Assign groups (allow students to work/communicate with bilingual student)
- Allow all students (entire class) to take measurement using metric ruler
- Enlarge diagrams on board/overhead
- Highlight key words; give explanation in native language, if possible.

Assessment:

- Make observations as students work together
- Have students write out R_f calculations to be collected
- Allow students to present findings to the class.

Follow-up/Homework:

Applying what you've learned:

- a. Design your own chromatography technique. What are the pros and cons of this design?
- b. Investigating your home: What household items contain pigment? Look under your kitchen sink, on clothing labels, refrigerator, etc. Students will be surprised to find that is everywhere. Have students share their findings.

References:

Lesson adapted from <http://www.col-ed.org/cur/sci/sci206.txt>

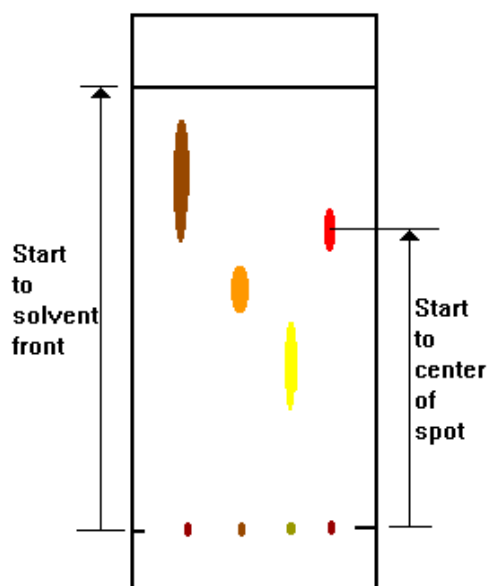
Plant Chromatography

Name: _____

Partners names: _____

Determining R_f

$$R_f = \frac{\text{Distance from start to center of substance spot}}{\text{Distance from start to solvent front}}$$



Determine the R_f value for each plant sample:

| Plant Sample | R_f Value (show work) |
|--------------|-------------------------|
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